CS 6210: Perf. Eval. of Computer Systems; Aug. 2011, Prof. Krishna Sivalingam
Tutorial 3, Aug. 26, 2011, OPEN BOOK/NOTES; CLOSED NEIGHBORS. TA help can be solicited.

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1. (5) Consider a 2-state DTMC representing channel state. The transition probability from GOOD to BAD State is given by a; the transition probability from BAD to GOOD State given by b. Assume that $0 \leq a, b \leq 1, |1 - a - b| < 1$. Determine the limiting state probability vector $\mathbf{v}$. If the bitrate under GOOD and BAD channel states are 100 Kbps and 10 Kbps respectively, what is the average bitrate of the channel under steady-state conditions?

2. (10) Consider a computer system with one CPU and 2 devices. A process runs on the CPU for one time unit and then requests one of 2 I/O devices with probability of 0.3 and 0.25 respectively. When the process finishes execution in the current time unit on the CPU, another waiting process is run on the CPU.

   Each process spends an average of five time units being serviced by device 1 and an average of four time units being serviced by device 3. What is the average CPU utilization under steady-state conditions?

   (OR)

   Mr. Gill Bates is an eccentric philanthropist with some money to donate to noble causes. Each day, depending on his mood, he donates a fixed amount of money. He can be in one of four possible moods (in order): QS (State 0), S, G, and QG (State 3). The amount of money donated per day while in each of these moods is respectively \$1, \$10, \$1,000, \$10,000.

   Each day morning, his mood (denoted by State i on the previous day) changes to a neighboring mood state with probability:

   $b_i = 0.4$(to a more philanthropic mood), $d_i = 0.5$(to a less philanthropic mood), $\forall i \geq 1$. Also, let $b_0 = 0.4, a_0 = 0.6$. Under steady-state conditions, what is the average money donated per day? Do you think he will be a sought-after philanthropist?